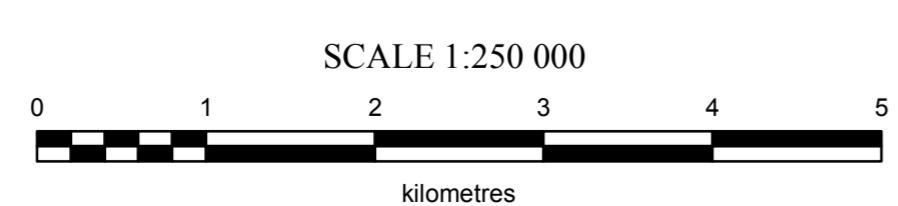


1:250 000-scale topographic base data produced by CENTRE FOR TOPOGRAPHIC INFORMATION, NATURAL RESOURCES CANADA. Copyright Her Majesty the Queen in Right of Canada. ONE THOUSAND METRE GRID Universal Transverse Mercator Projection North American Datum 1983 Zone 8. CONTOUR INTERVAL 100 FEET Elevations in metres above Mean Sea Level

Polymetallic Ag-Pb-Zn Weighted sums model (Geology Levelled) Sheet 3 of 15



Use diagram only to obtain numerical values APPROXIMATE MEAN DECLINATION 2015 FOR CENTRE OF MAP

11SP	105M	105N
MCQUEERSTEN	MAYO	LANSING RANGE
115I	105L	105K
CARMACKS	THIS MAP	TAY RIVER
115H	105E	105F
ASHRIK LAKE	LAKE LABERGE	QUIET LAKE

INTRODUCTION

New geochemical data from re-analysis of archived stream sediment samples have been assessed using weighted sums modeling and catchment basin analysis as described in the report accompanying this map (Mackie et al., 2015). Both commodity and pathfinder element abundances are evaluated to highlight areas that show geochemical responses consistent with a variety of base- and precious-metal mineral deposit types. The results of modeling completed using two approaches are presented as a series of catchment maps and associated data files. This release is part of a regional assessment of stream sediment geochemistry that covers a large portion of Yukon.

SAMPLING AND ANALYSIS PROGRAMS

Stream sediment and water samples from the Glenlyon map area (NTS 105L) were collected as part of a reconnaissance-scale in 1988 as part of the Canada-Yukon Mineral Development Agreement (Friske & Hornbrook, 1989). This survey also covered the western part of the adjacent map sheet to the east (105K) however the current assessment deals only with samples located within NTS 105L (905 sites). Field descriptions and initial geochemical data were released in Geological Survey of Canada (GSC) Open File 1991. Re-analysis of archived sample material was completed in two stages and the final geochemical data were released in Yukon Geological Survey Open File (Jackman, 2015). The reader is referred to these open files for detailed descriptions of sampling techniques, analytical procedures and quality control measures.

While the database for this area contains 905 sample sites, only 795 samples are included in this assessment as catchment basins (provided by the YGS) were only generated for those samples that could be reasonably assigned to a specific stream polyline. This unusually high proportion of 'missing' catchments reflects both the inaccuracy of the location data from the historic sampling programs and the difficulty in defining catchment basins in areas of subdued topography.

MINERAL OCCURRENCES

As shown in Table 1 (Yukon MINFILE, 2015), the most significant metal mineral occurrences documented within the Glenlyon map area are of the sedimentary exhalative Zn-Pb-Ag type (Clear Lake deposit; Hackey, Lobo and McArthur prospects). Other types of mineralization include polymetallic Ag-Pb-Zn vein (Front, Hub and Muir prospects), W skarn (Felix and Dromedary prospects), Pb-Zn skarn (Carlson and Little Salmon prospects), volcanogenic massive sulphide Zn-Pb (Government and Highway showings) and Cu-Ag vein (Frenchman and Obbird showings). The past producing Faro and Vangorda Zn-Pb-Ag mines (Anvil SEDEX district) are located in the adjacent NTS map area to the east (105K). The Minto Cu-Au-Ag Mine and Williams Creek Cu-Au-Ag-Mo and Mt. Nansen Cu-Au-Mo deposits are located in the adjacent NTS map area to the west (115I).

WEIGHTED SUMS MODELING

As described in the report accompanying this map (Mackie et al., 2015), two approaches have been used to subdue the influence of background lithological variation and secondary absorption on the composition of stream sediments.

One uses data levelled by the dominant geology mapped within each catchment, while the other uses residuals calculated from regression against principal components. Weighted sums models (WSM) were generated using the processed data for a variety of deposit types. The importance rankings used in WSMs are summarized in Table 2. Each model is optimized for a target deposit type however other deposit types may be represented in a given model due to similarities in elemental abundances and associations. Notably, only a few of the known deposits are located within delineated catchment basins limiting the ability to validate the models.

For certain elements (e.g., Cd, Ag, Sb and Zn) levelling by dominant lithology did not fully subdue the interpreted stratigraphic control on the spatial distribution of these elements. In order to reduce this impact in the WSMs these elements were given lower importance rankings (or were omitted) for certain deposit types. Negative rankings were assigned to certain variables to help differentiate deposit types with similar metal associations. Despite these efforts this approach generates WSM models that preferentially highlight catchments within the northern part of the map area.

The first principal component, accounting for ~30% of the total variation, shows high positive loadings for Se, Cd, Hg, Ag, Sb, Mo, Ba, Cu and Zn; and high negative loadings for Ce, La, Rb, Li, Al, Ti, Y and Sn. These associations for spatial groups that match the distribution of Earn and Askin group and Mount Christie Formation sedimentary rocks in the northern part of the map area, and felsic intrusive rocks of the Cassiar Suite in the central portion of the map area, respectively. The second principal component, accounting for ~17% of the total variation, shows high negative loadings for Mg, Ca, Sr, Na, Zr and Cr forms a spatial trend matching the distribution of Carmacks suite mafic volcanic rocks and adjacent Laberge Group sedimentary rocks in the southern part of the map area. The third principal component shows high negative loadings for Ni, Co, As, Cr and Cu and matches the distribution of Klitkik Group metamorphosed mafic-intermediate volcanic and sedimentary rocks. Regression analysis of these metals against the relevant principal component effectively subdued these terrane-effects while preserving and in some cases enhancing responses related to known occurrences.

The effectiveness of historical sampling coverage has been assessed empirically using graphs of WSMs plotted against catchment surface area to determine the ideal maximum catchment size (10 square km). Catchments that larger than this are interpreted to have been under-sampled and thus require further sampling to properly evaluate the area for geochemical anomalies. Given the likelihood that a mineralization 'signal' would be progressively diluted with increasing catchment area, large catchments with marginally high WSM scores may also be of interest.

Table 2: Importance rankings for weighted sums models using data levelled by dominant mapped geology.

Target Deposit Type ¹	Other Deposit Types ²	Mn	Fe	Co ³	Ni	Cu	Mo	Zn	Pb	Ag	Au ²	As	Ba	Cd	Sn	Se	Tb	Hg	Ti	Bi	W
Polymetallic Ag-Pb-Zn Zn skarn	SEDEX (high Ag); VMS (felsic); Pb Zn skarn							2	3	4		2			1	1					
SEDEX Pb-Zn	VMS (felsic); Pb-Zn skarn; polymetallic Ag-Pb-Zn					1		3	4	1			1	1							-2
VMS (mafic)	Cu skarn	2				3	-1	1													-1
Intrusion-related Au	Epithermal Au-Ag										4	2				2					1
Epithermal Au-Ag	Intrusion-related Au					-2					4	3	1			1	1				1
Porphyry Cu-Mo	Cu skarn; Cu-Ag vein; Porphyry Mo					-2	4	1			1	1	1								
W skarn	Porphyry Mo							1								1					2

¹ Polymetallic Ag-Pb-Zn type includes vein and manto styles; SEDEX = sedimentary exhalative; VMS (felsic) = Zn-rich volcanic-hosted/associated massive sulphide deposits (i.e., Kuroko type); VMS (mafic) = Cu-rich volcanic-hosted massive sulphide deposits (i.e., Cyprus and Besithi types) ² Co residual following regression against Fe and Mn; ³ Au data is not levelled by dominant geology, instead raw data is used following a log10 transformation.

LEGEND

Weighted sums model (Geology levelled)

Polymetallic Ag-Pb-Zn deposits

- Incomplete element suite
- 0-50th percentile
- 50-75th percentile
- 75-90th percentile
- 90-95th percentile
- 95-98th percentile
- 98-100th percentile

Other Legend:

- Town
- Mineral Occurrence
- Road
- Contour
- River
- Water Body
- Wetland
- Sample Location
- Catchment
- Catchments >14 km²

REFERENCES

Friske, P.W. and Hornbrook, E.H., 1989. National geochemical reconnaissance stream sediment and water geochemical data, central Yukon (105K/W and 105L). Geological Survey of Canada, Open File 1991.

Jackman, W., 2012. Regional stream sediment geochemical data, Glenlyon Area, central Yukon (NTS 105K west & 105L). Yukon Geological Survey, Open File 2012-7.

Jackman, W., 2015. Regional stream sediment geochemical data, Glenlyon area, central Yukon (NTS 105K west & 105L). Yukon Geological Survey, Open File 2015-9.

Mackie, R., Arne, D. and Brown, C., 2015. Enhanced interpretation of regional stream sediment geochemical data from Yukon: catchment basin analysis and weighted sums modeling. Yukon Geological Survey, Open File 2015-10.

Yukon MINFILE, 2015. Yukon MINFILE - A database of mineral occurrences. Yukon Geological Survey, [www.data.geology.gov.yk.ca](http://data.geology.gov.yk.ca), accessed May 2015.

RECOMMENDED CITATION

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Catchment basin polygons generated by the Yukon Geological Survey (J. O. Bruce). Any revisions or additional geological information known to the user would be welcomed by the Yukon Geological Survey.

Paper copies of this map and the accompanying report may be obtained from the Yukon Geological Survey, Energy, Mines and Resources, Government of Yukon, Room 102-300 Main St., Whitehorse, Yukon, Y1A 2B5, Ph. 867-667-3201, Email geology@gov.yk.ca.

A digital PDF (Portable Document File) file of this map may be downloaded free of charge from the Yukon Geological Survey website: <http://www.geology.gov.yk.ca>.

Yukon Geological Survey
Energy, Mines and Resources
Government of Yukon

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Weighted sums model for Polymetallic Ag-Pb-Zn deposits levelled by geology (NTS 105L) Sheet 3 of 15

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